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AN

Anatomical Account

OF THE

ELEPHANT

Accidentally Burnt in

DUBLIN,

ON

Fryday, June 17. in the Year 1681.

Sent in a LETTER

To Sir *WILL. PETTY,*

FELLOW OF

The Royal Society.

TOGETHER

With a Relation of new Anatomical Obſervations in the Eyes of Animals: Communicated in another LETTER to the Honourable *R. Boyle,* Eſq; FELLOW of the ſame SOCIETY.

By A. M. Med. *of* Trinity *Colledge near* Dublin.

London, Printed for *Sam. Smith,* Bookſeller, at the *Prince's Arms* in St. *Paul's Church-Yard.* 1682.

Mallen

Honoured Sir,

MY Ambition to ſerve the R.S. in general, & my Obligations to your ſelf in particular, are the only Motives that induce me to communicate my Obſervations on the Elephant burned here laſt Summer; for I underſtand that they are likely to be made publick, and am very unwilling to appear in Print, eſpecially at the diſadvantages which now I muſt: For People admiring the Elephant, as well for his docility, as bulk, and rareneſs in theſe Countries, will expect ſo curious an account of him, as may furniſh them with the Reaſons, why he comes to be more capable of doing things which ſeem to require Ratiocination, than any other Brute that we know. They may moreover think that from an exact deſcription of the ſeveral parts of his Body, moſt, if not all Veſſels and Organs being larger conſiderably in him,

than in other Creatures, a great light into the true uſes of parts might be had.

Now Sir, I muſt deſire you to inform that Honourable Society, for whom you deſign theſe following Notes, and of whom you are a Member, with the Reaſons why I cannot anſwer ſuch great expectations. My want of Optick Glaſſes, and of other helps for curious Obſervations were conſiderable.

Moreover the Circumſtances of time and place were unfortunate; for the Booth wherein the Elephant was kept, took fire about Three a Clock in the morning, on *Friday* the 17th of *June*; upon this the City being alarm'd, multitudes were gathered about the place: And when the fire was extinguiſhed every one endeavoured to procure ſome part of the Elephant, few of them having ſeen him living, by reaſon of the great rates put upon the ſight of him. To prevent his being taken away by the multitude, the Manager, Mr. *Wilkins*, procured a File of Muſqueteers to guard him, till he ſhould build a ſhed where he might ſecurely diſjoint him, in order to the making of a Skeleton: This he got finiſhed at Seven a Clock at Night, and about Eight I heard of his deſign. Being deſirous to inform my ſelf in the ſtructure of the Elephant, I made ſearch for him, and having found

found him I proffered my ſervice to him; of which when he accepted, I endeavoured to perſuade him to diſcharge ſome Butchers which he had in a readineſs to order the Elephant after their way, and to leave the whole management of the matter to me, and to ſuch as I thought fit to employ, deſigning a general diſſection, and that the *Icons* of each part ſhould be taken in order by ſome Painters, with whom upon this occaſion I could prevail: But my endeavours prov'd fruitleſs, becauſe that about Ten a Clock that night, when we went to the ſhed, to find what condition the Elephant was in, he emitted very noiſom ſteams. Theſe made the Manager fear (the ſhed being very near the Council-Chamber, and the Cuſtom-Houſe,) that the Ld. Lt. or Ld. Mayor would order it to be taken away as a nuyſance, and that ſo in all probability it ſhould be loſt, and that perhaps he himſelf ſhould be puniſhed for ſuffering it to be there. When I conſidered, that in caſe he did not diſpoſe of him that Night, the next Day being *Saturday*, I ſhould be able to accompliſh but a ſmall part of what I deſigned, and that it would be both chargeable and difficult to preſerve him from the rabble till *Monday*, and that then the ſtink would be altogether intolerable, if it ſhould encreaſe in proportion to what it had done that day. I conſented to

have

have the buſineſs done that night, and for expeditions ſake, to make uſe of the Butchers as Aſſiſtants, but ſo as to be directed by my ſelf in every thing: But their forwardneſs to cut and ſlaſh what came firſt in their way, and their unrulineſs withal did hinder me from making ſeveral Remarks which otherwiſe I would have made: Thus the Elephant was disjointed by Candle-light. Some parts were burnt, moſt of thoſe that were not, were more or leſs defac'd by being parboiled. This may ſatisfie the R. S. how difficult it was to give a ſatisfactory Anatomical Account of the Elephant, and that the following ſlender one is given to ſhew my readineſs to ſerve them, and my Obedience to your Commands.

I ſhall not trouble you with a Repetition of what has been ſaid of the Elephant by *Pliny*, *Geſner*, *Tavernier*, and others, being very little, if any way, inſtructive to any deſirous to underſtand the Anatomy of that Creature, but ſhall faithfully, and as plainly as I can, acquaint you with what occurred remarkable to me, upon a view of the ſeveral parts of his Body, and ſhall add only ſome conjectures of my own concerning the uſes of ſome parts derived from their ſtructure.

cula. I ſhall begin with the *Cuticula*, (of which I keep a piece which was raiſed by the Fire from a part of the

the *Cutis*, on which the Elephant was found lying, and which therefore was not defac'd) when I examined this, I found it covered all over with a ſtrange ſort of Scab, in many places reſembling old Warts, deeply jagg'd, and the carnous Fibres of the Muſcles of Beef, when much boiled, and tranſverſly cut, but of a dirty tawny Colour. Theſe Scabs (if I may ſo call them) both ſlit and cut, lookt like ſhort pieces of Whalebone. They did ſo firmly ſtick to the *Cuticula*, that I could not pull them from it, nor the parts of which they conſiſted (though they were much divided) from one another, without tearing it. And yet the *Cuticula* was much tougher and thicker than any that I have ſeen.

The length of theſe Scabs was in ſome $\frac{1}{3}$ or $\frac{1}{4}$ but in other places not above $\frac{1}{10}$ or $\frac{1}{12}$ of an Inch. The cauſe of which difference I take to be the Elephants wearing, by rubbing or lying, ſome parts of them, whilſt others were ſlightly or not at all worn.

I could find but very few Hairs without this ſcab, but many within, and even with it. The Elephants inclinations to Itch, and to rub himſelf againſt whatever came in his way, kept thoſe Hairs that were even with the outſide of the aforeſaid ſcab, from appearing of any conſiderable length. The hard-

neſs

neſs of the ſcab by keeping the Roots of the Hairs faſt, did very much contribute to their wearing on the outſide, as well as to their preſervation on that within. The length of the Hairs for the moſt part was equal to that of the Scabs.

The Hair. The Hair in the *Cutis*, when diveſted of its *Cuticula*, were numerous, and many of them were conſiderably ſtiffer and thicker than the briſtles of a Hog. They were black, and ſkinny as were found in the *Cuticula*, when ſeparated from the *Cutis*, were plainly covered over with thin Membranes, from the extremity of the Roots to the *Cuticula*. Theſe (with ſubmiſſion to better Judgment) I take to be the linings to peculiar *ductus*, which by the heat of the Fire were ſeparated from them, as the *Cuticula* was from the *Cutis*. In theſe *ductus* the Hairs were manifeſtly planted. Now ſeeing that cloſe about the Roots of Hairs, as well as on the Pores, near which there is no Hair, a dew may be diſcerned ſoon after ſweat is wiped away. I take it to be reaſonable to think, that there are two ſorts of Pores in the skins of Animals. One ſmall, deſigned altogether for the ſeparation of ſuch Liquors and Vapours, as are uſually thrown off by inſenſible Perſpiration and Sweat. The other to contain and nouriſh Hairs; for at the bottom of each of theſe *ductus* there appeared to the naked Eye

ſmall

ſmall Glandules when the Skin was divided to the extremity of the roots. Theſe I ſuppoſe to be the *glandulæ miliares*, obſerv'd by the moſt accurate Anatomiſts, *Segnior Malphigi*, and Dr. *Steno*, in their ſtructure of the *Cutis*. Theſe probably ſeparate from the maſs of Blood an excrementitious matter, fit for the nouriſhment of the Hairs, and what is not ſpent in that, is (I ſuppoſe) caſt out between the Hairs and the aforementioned thin Membranes, which, upon that account, may be properly called Lymphæducts; and ſo likewiſe may the ſmaller ſort, (of which more anon) and each of them a proper *Vas excretorium* to a *Glandula Miliaris*.

The Hairs which came out of the Skin, and which were in the *Cuticula*, were from the end of the root to the *Cuticula* in length between $\frac{1}{4}$ and $\frac{1}{2}$ of an *Inch*.

The outward *ſuperficies* of the *Cutis*, freed from the *Cuticula*, was very uneven, by reaſon of a vaſt number of Pyramidal *papillæ*, about the bigneſs of ſmall Pins heads: To fit each of theſe there were cavities in the *Cuticula*. Theſe *papillæ* were probably pores, being to the ſight like thoſe that a ſudden Cold produces in our Skins, and which unqueſtionably are ſuch. *Cutis.*

Now if it be granted, that in Brutes there is an inſenſible Perſpiration (which all rational men

that ſees them ſweat will allow, foraſmuch as what is by that caſt off, is not ſo groſs a Body as Sweat,) and if their inſenſible diſcharge be granted proportionable to that of a man; it will follow, that the Elephant being a Creature of extraordinary bulk, muſt have very many pores, and very large ones too, ſuch as may be diſcerned by the naked Eye, when we find them to be ſo even in Men, in the Palms eſpecially of the Hands, and in them all other Veſſels are proportionably leſs than they were in the Elephant. *I* ſay, that the pores muſt be both numerous and large, for the uſe aforeſaid, eſpecially if we may confide in *Sanctorius* his *Statical Obſervations* of a mans inſenſibly perſpiring in a Winters day 50 Ounces, and upwards, which is ſomwhat more than a 54th part of an ordinary mans weight, which *I* take to be about 170 *l.* (and upon ſuch meaning himſelf, *I* ſuppoſe him to have made his Experiments,) and allow the Elephant to perſpire proportionably, we will find that his daily inſenſible evacuation will amount to very near 93 *l.* if we may believe ſome that has ſeen the Elephant put on Shipboard, and taken off, that ſaid he weighed 2½ Tuns or 5000 *l.* of which 93 *l.* is about a 54th part. Though *I* am not forward to believe, what *I* have at ſeveral times been told, as to his weight, nor aſſured that his Tranſpiration was pro-

portio-

portionable to that of a man, becauſe of the outward ſcab, which might bar it; yet that he did much tranſpire *I* believe, from the vivacity of his *ſpecies*, and have together with many Arguments for perſpiration in general, one in particular to alledge for the great neceſſity of it in this Animal, and that is this, his blood and fleſh did extraordinarily abound with an urinous Salt, which made the maſs of humours extraordinary active, and conſequently capable of making their way through the ſmalleſt paſſages, the pungency of the Salt not a little irritating the pores to an excretion. I ſuppoſe moreover that this Salt ought to be neceſſarily and continually caſt off with ſeroſities, to prevent diſeaſes conſequent to too great a quantity of *Volatile Salt* in the Body. Why the exorbitancy of this ſort of Salt, as well as that of a fixed *Marine Salt* in *Scorbutick* Perſons, ſhould not cauſe many diſtempers, (though few of ſuch may be known to the Inhabitants of our cold Climates,) I cannot gueſs; but that he did ſo abound in an Urinous Salt, did appear not only from the urinous *effluvia* which ſo affected my Noſtrils that I was ſcarce able to endure them; but alſo from the ſmarting which his blood occaſioned, (contrary to what I ever obſerv'd in that of other Creatures) lighting on a cutt which I accidentally at that time receiv'd in one of my Fingers. The difference be-

tween the pungency of the Salt in this Blood, and that in ſtale Urine was ſuch, that the latter uſually in a little time ceaſes to ſtimulate a tender part kept ſteept in it, whereas the former did make my Finger all that night, and the next day whilſt embrued in it continually ſmart. But more eſpecially it appeared from the taſt of his Fleſh when dreſſed on the Coals, before a fire, or fri'd, (boiling in Water took it clear away) which was, as near as I can gueſs, like that of lean Beef ſeaſon'd with Salt of Hartshorn.

It is not only probable therefore that the Elephant did inſenſibly perſpire much, but alſo that thoſe Pyramidal *Papillæ* were the paſſages through which he did tranſpire, nothing except them and the places of the Hairs appearing any way like pores.

tis ſubntia. When the *Cutis* was cut through, as far commonly as the roots of the Hairs reach'd, it was like the callous or horny part of Brawn; but the inner part was very glandulous with a little fat interſpers'd.

aſſities tis. The *Cutis* before it dried was in ſome places 1¼ Inch thick, and in other places not above an Inch, and in others ſomwhat leſs.

I could find no cutaneous Veſſel of any remarkable bigneſs, and but very few ſmall ones.

nnicu- carno- defuit. *I* made ſearch for the *Panniculus cárnoſus*, but found none. *I* was the more diligent in my ſearch for it, becauſe that *I* underſtood it was uſual with the

the Elephant to kill the Flies which lighted on the cracks in his Skin, and tormented him; and this he did by bringing the sides of the cracks close together of a sudden, which *I* thought to be performed by that cutaneous Muscle, meaning the aforesaid *Panniculus carnosus*, but nothing like it appearing, *I* concluded that what *I* supposed ought to have been done by that Muscle, was in this Animal done by putting himself suddenly in a posture to wrinkle the skin of that side that was attack'd by the Flies, and this to be done by bending his body that way, by which means what was before streight for him, being now too full, the sides of the cracks were forced close together, & thus the Flies were bruis'd.

Defuit & Membrana adiposa.

There was no *Membrana adiposa* to be seen about him, neither was there inwardly or outwardly, except a little in the *Perineum*, any appearance of fat; but instead of the two last mentioned integuments, there was a very strong nervous Membrane, obliquely descending from the *Spinæ dorsi* to the *Sternum*, and the *linea alba*. This Membrane was very tough, and very near as hard to be cut as Whalebone of the same thickness; which all along the back-bone was about $\frac{1}{4}$ of an *I*nch; but the nearer the end *I* tried it the thinner *I* found it. This Membrane seem'd to terminate in the *linea alba*, as the tendons of the Muscles of the *abdomen* usually do.

Membrana nervosa.

The

The nervous Fibres of which this Membrane was made, were very distinguishable, and might easily be separated for their whole length. *I* have nothing to say as to its Origin, unless it proceeded from the *dura Mater*. This doubtless was design'd to strengthen this Creature, and perhaps that the weight of the *Viscera* contain'd in the *Abdomen*, should not distend the *Peritoneum*, and the Muscles adjoining, so as to let them hang lower than was convenient.

The Taxwax. The Ligament, commonly call'd Taxwax, reach'd from the Head, to which it grew, to about the 13th *vertebra* of the *dorsum*; it was double, one on each side of the *Spinæ vertebrarum colli & dorsi*; it was both very thick, and very broad, and consequently very strong; its use doubtless was to assist the Muscles and other parts of the Neck, to bear the extraordinary weight of the Head, being placed not flat, but edgewise, like Planks used as Joices to bear up Floors. And this piece of Architecture is found in most, if not all Quadruped's, for the very same purpose; but being needless, it's wanting in men.

I made no other Remark on the Muscles, but that they were very large, and consisted of Fibres much thicker than those of Beef.

Musculi duo Retractores Penis. In searching for the *Testes*, I found Muscles so like them, that I doubted not but that they were the very *Testes*; their shape did most exactly resemble them;

them: and their tendons, before the *Teſtes* are taken out of the *Proceſſus* of the *Peritoneum*, might paſs for the ſeminary Veſſels; nothing by Candle-light, but an examination of them by diſſection, could have undeceived me. I was very deſirous to ſee the Anatomy of one of them, and did what I could to inform my ſelf that way, by which means I diſcovered my Errour, and having found two Muſcles unlike any that ever I ſaw, I trac'd them to the inner and lower ſide of the *Os Iſchion*; where I found them implanted; I traced the tendons likewiſe, and found that when they had gone ſingly near upon 4 Inches, that they joined in one, which went directly under the middle of the *Penis*, and reach'd beyond a crookedneſs that *I* obſerved in it: this was in length about 8 *Inches*, it was then within 6 or 7 *Inches* of the *Glans* terminated: having expanded itſelf into a Membrane.

There was, beſides theſe, a nervous Body that began underneath, near the aforeſaid tendons, about 8 *Inches* from the root of the *Penis*, and reached (diſtinct from the Yard) 9 *Inches*, before it was inſerted again in it, at a place 5½ Inches from the *Glans*.

When I conſidered that the Actions of all Muſcles were, by a Swelling and a Contraction of their Fibres, *I* was of opinion on the account of thoſe Muſcles, and of that nervous Body ſo conveniently *Eorũ uſus.*

niently plac'd for that purpoſe, that the Elephant was a Retromingent, and very probably a Retrocoient Animal. The crookedneſs and bending downwards, which I obſerved in the *Penis*, ſomwhat ſhort of the end of the Tendon confirm'd me in that Opinion, & laſtly the confeſſion of thoſe that were his conſtant Attendants, put the buſineſs out of doubt; for they ſaid, that whenſoever the Elephant would make water, they obſerv'd him unſheath his *Penis*, and turn it backwards, and ſo piſs between his hind Legs outwards. Here nature manifeſted her care in making a peculiar proviſion for this unweildy *Animal* to prevent his wallowing in his own Excrements.

After this, and a long ſearch, I found the *Teſtes* which were not contain'd in a *Scrotum* or *Capſula*, but lay in the *Perineum*, cloſe joined on each ſide to the *Penis*; they were neither of the uſual ſhape, bigneſs, nor included in a *proceſſus* of ye *Peritoneum*. Their ſhape was very like that of a Cheſnut; they were thicker on the ſide that grew to the *Penis* than on the oppoſite. They were flat & round. They were not ſutable to the other parts of his Body; for if I had the curioſity to weigh them, I believe that both ſhould be found to weigh but little more than 3, or at moſt 4 ounces. They were join'd to the *Penis* by a great many, at leaſt 100 ſeminal *Tubes*, which may be properly call'd

call'd *Vasa deferentia*, & which depositted the elaborated *Semen* in several Rhomboid Cells, plac'd in the body of the *Penis*, which in this Creature was the common and only repository for the seed that I could find. These Cells were turgid with Sperm, and so were the *Tubes*; the latter were larger than any that ever I saw, in the *Testes* of other Animals; most of them without any force receiving a Block Tin Wire of equal thickness with the biggest of the ordinary Pins; and this they received for an Inch, and sometimes more, when the *Tube* was streight, as most of them were; but when I followed them further into the Body of the *Testis*, they became sensibly smaller & smaller till they disappear'd.

I search'd for that which Dr. *Highmor* calls a *Ductus*, and *DeGraafe* more truly makes the *Stabilimentum* to the Vessels in the *Testes* both Blood and Seminary; but could not clearly see it. The blood Vessels came into the *Testes* by the *Vasa deferentia*.

Though these were small and disproportionable, yet I took them to be the *Testes*, nothing else outwardly appearing that contain'd Seminary Vessels, till I understood by the curious Anatomist and learned Physician Dr. *Needham*, that my description of the Testicles of the Elephant did agree to the *Prostatæ* of a Boar; upon which I concluded that I mistook the *Testes* for the *Prostatæ*, there being a great resemblance between these Animals, and having found Two Substances (of which more anon) between the Kidneys and the neck of the

Bladder, which might very well be *Teſtes*, and which, till *I* diſcours'd that ingenious Gentleman *I* did not well know what to make of.

I ſhall, when *I* come to the inward parts, ſay ſomthing of the *vaſa præparantia.*

The *vagina* for the *Penis* was, at the opening, horny, and was ſhut up ſo cloſe, that there was not room for a mans little finger to get in. We could not, without dividing it, come at the Yard.

nis. The *Penis* look'd more inconſiderable by being ſo cloſely ſhut up, than it did when freed from the Sheath; it was larger than that of a Stone-Horſe, but hardly ſo long.

rethra. The *Urethra* was large, for it admitted a round ſtick, near as thick as a mans Finger, which was thruſt into it to ſtreighten it.

eritone-m. The *Peritoneum* was a very tough, thick, white Membrane, much wrinkled, that might be divided into many, though not diſtinct, Membranes.

)menta. The *Omentum* was nothing but a very thin and double Membrane, together with a net of ſmall blood-veſſels, accompanied with ſmall threads of Fat; its inſertions were as uſually they are in other *Animals.*

Ventricu-ulus. The *Ventricle* was in length 4 foot, and about 3 inches, it was round about 3½ Foot. The *Æſophagus* was not inſerted in the extremity of it, as in Men, Dogs, and many other *Animals*, but a Foot from that, towards the middle of it, in which (if I miſtake not) it agrees with

with the Stomach of a Horſe. There was but one, contrary to what ſome did imagine, if we do not reckon the *Cæcum* and the *Colon* for two. I found ſeveral peble ſtones in it, whereof ſome were large, which if weighed, would be found to be between 3 and 4 ounces. By their colour and ſhapes I ſhould gueſs them to be taken, not long before, from ſome Sea ſhore. They were ſwallowed, I ſuppoſe, to cleanſe the Stomach & Guts. I did not find any thing elſe remarkable in the Stomach, its ſhape, Coats and Fibres agreeing in other things, with that of Men, Dogs, &c.

Inteſti The *Inteſtina tenuia* were burnt in many places, but *tenuia* not quite through any where, excepting two or three.

Ileum *Jejuni* The *Ileum* and *Jejunum* were not extraordinary big, but were in length about 52 Foot.

Duode The length of that which is commonly call'd the *Duodenum*, was about 4½ Foot.

Cæcum The *Cæcum* was very large and diſtended with hard dung; its Coats were thicker, and its Fibres were ſtronger than thoſe of the Stomack. The thickneſs of the Fibres vvas very diſcernable vvhere a part of this Gut vvas burnt. The length of this Gut vvas about 20 inches, but its meaſure round about vvas about 2½ foot.

Colon. The *Colon* vvas monſtrouſly big, for it vvas in ſome places upvvards of 3½ Foot round, and in others it vvanted ſomvvhat of 3 Foot; its length vvas to an inconſiderable matter, 15 Foot, though I ſearched diligenly for the *Valvula coli*, I could perceive nothing of it.

tum. The *Rectum* (by which I mean the remainder of the *Inteſtina craſſa*, (though a part of them could not be properly ſo called) becauſe of the equality for the moſt part of their Diameters, and diſproportion to the *Colon*, and of my want of a name for a new Gut.) was about 4 Foot in length; and ſo the whole length of the Guts was about 75 Foot, or 25 Yards.

rarum iculus There was a *Faſciculus* of ſtreight Fibres, near as thick, and altogether as broad as a mans middle Finger; this (to the beſt of my remembrance) began at the *Cæcum* and reach'd to the *Anus*. This was oppoſite to the Meſentery, and was, I ſuppoſe, deſign'd upon occaſion to ſhorten that ſide of the Guts, as the Meſentery did the oppoſite; that ſo the *Periſtaltick motion* of the Guts might be more equal, and conſequently, that the Excrements might be the more eaſily protruded, the paſſage being more direct; and alſo that their propulſion might be in leſs time, becauſe that the journey is thereby ſhortened.

The Fibres of the Guts, both ſtreight and ſpiral (for ſo they ſeem'd to be, and not truly circular) were very ſtrong and thick.

There were many large Veins in the Guts, and between the inner *Tunica* (which by the bye was very *glandulous* and thick) and the third, or that next it, there was a curious *Plexus retiformis* of Blood-veſſels.

ſente-. m. The *Meſentery* was very ſtrong, being very thick, it had no fat about it, neither was there any relique of it.

The

The *Meſaraick Veins* were very large, many of them equalling, and ſome exceeding in bigneſs the *Vena cava* of a Maſtiff Dog. I do not remember to have ſeen any remarkable *Glandule* in it. *Vena ſaraic*

The Liver was very large, and conſiſted of 2 *Lobes* only, each long, round, and a little flattiſh. The *Fiſſure* which made thoſe *Lobes* reach'd ⅔ of the length of the Liver. I found the Stomach plac'd between theſe two, one lay upon it, and the other lay between it and the *vertebræ* of the back, like a bolſter: Whether this was the natural place of the Stomach, or put there by the Elephants ſtrugling to get looſe to avoid the fire, I will leave to you to determine. *Hepa*

The Membrane that inveſted the Liver was rais'd from it for a conſiderable way, as if it ne'er had been join'd to it; though this Membrane ſeem'd to be whole, and look'd like the *Cuticula* raiſed by a bliſtering Plaiſter, yet there was no *ſerum* contained in it; and where it ſeemed to be intimately join'd to the Liver, by a gentle pull it came off, without tearing any thing that I could take notice of, as if it had been but very ſlightly faſtened to the Liver, or rather a bag which contain'd it, and exactly fitted it: But for all this I cannot but think that this Membrane, as well as every one, which immediately includes any of the *Viſcera* have beſides other uſes, this one; namely to terminate and ſhut the capillary veſſels; ſo to prevent a gleeting of ſerous humours, which would inevitably follow, and *Memb na hepa inveſti*

which

which would ſoon ulcerate as well the adjacent, as the part itſelf, and we find that Nature does moſt commonly obviate ſuch inconveniences; therefore I muſt wholly impute the clear in ſome places, and in others that eaſie ſeparation of the Membrane from the Liver, tothe fire.

The *Bilis* was depoſited at the end of the firſt Gut, improperly call'd the *Duodenum* in this Creature, that is 4½ Foot below the *Pilorus*, from which place I trac'd the *ductus communis* to the Liver, to ſee the *veſica fellea*, but it was wanting, and in the place of it I found the *Porus Biliarius* come out of the Liver, as the *Ductus hepaticus* uſually does. I obſerv'd likewiſe (which before I have done in other Creatures) that the *Bilis* found in that, differed both in colour and conſiſtency from that which I found in the *Ductus Hepaticus*; for the latter was a clear light yellow, and was congeal'd with all like a Jelly; whereas that of the former was of a dark green; and was ſomwhat more fluid than the Gall of an Ox. That there is this difference in the Galls of moſt *Animals*, is a thing that I believe time will diſcover, which then will excite diſcerning men to find out their different uſes. I could find nothing peculiarly remarkable in the ſubſtance of the Liver by cutting, only that it was manifeſtly glandulous, as the ſagacious *Malphigi* obſerved.

The *Pancreas* was very long, and large; for it reacht from about the middle of the Stomach to the *Jejunum*, which

which ſpace could not be leſs than 6½ Foot: it was a *Glandula conglomerata* as the *Pancreas* always is, and had its *ductus* ſo wide, that it could without force contain my little Finger; it opened into the Gut where the *ductus felleus* did: Whether both the paſſages join'd in one before their aperture into the Inteſtine or no, is a thing that I forgot.

I found a *Succus* in the *ductus*, not limpid as uſually it appears, but of a very dark green colour, and yet very fluid, ſeeming to contain no viſcid Phlegm. I wanted the curioſity to taſte it. *Ejuſd. ductu*

The Spleen was between 3 and 4 Inches in breadth, and in length 4 Foot, and ſomwhat more; it was very glandulous, agreeable to the ſame *Malphigi*'s Obſervations in his Book *De Viſcerum ſtructura*. I ſaw nothing elſe in it that deſerv'd particular notice to be taken of it. *Lien.*

The *Renes ſuccenturiati*, or *Glandulæ renales*, were placed in this, as in other *Animals*, but they differed in their length (which was about 3 inches) from that of other Creatures; they were hollow, and contained an ill coloured blackiſh blood, for which, I ſuppoſe, they are called *Capſulæ atrabiliariæ*; they were thicker than a Mans Thumb. *Glan renal*

The Kidneys lay, in a hollow exactly fitting them, in the Loins, and could hardly be diſcerned, though each of them was little leſs than a Childs Liver. Their Figure was Oval; they were included in a very ſtrong *Rene*

Mem-

Membrane, vvhich vvas faſtened to them in no place, but at the emulgent Veſſels. When this was taken off, each of the Kidneys was found to conſiſt of ſix *Lobes*. The Cavity uſually found in other Kidneys, called the *Pelvis*, here was wanting.

I found the *Ureter* divided into 6 parts, one for each Lobe, each of them (as near as I can gueſs) of equal Diameter with the *Ureter* itſelf. Theſe went into their reſpective Lobes, about an inch before their arterial ſubſtance terminated.

There were no *Caruncuiæ Papillares*, neither could I find any thing that made the manner of ſeparating the Urine, more intelligible than formerly it was.

The *Ureter* was no wider than that of an Ox; it had nothing peculiarly remarkable, except its diſproportion to moſt of the other parts of the Body.

The *Veſica Urinaria* was much of the ſame ſize with an Oxes Bladder, but much ſtronger, having thicker Fibres.

The *Venæ præparantes* were large. I divided that which was inſerted into the emulgent, lengthwiſe; and, within a little more than an inch to its inſertion, I found many *valves*, I gueſs about Eight or Ten, theſe were of divers ſhapes, all fitted to hinder the return of the Blood into the variouſly divided Spermatick Vein; which here from Eight or Ten Rivulets became one great Channel.

Within

Within about an inch of this, and ſomewhat more than two of the Kidneys, I found a ſubſtance of the ſhape of a Pear: but near three times as big as the largeſt Pear ever I ſaw. I did what I could by different ways of diſſection to find out what manner of thing this was, which was altogether ſtrange for ought I knew: but after all can give but a very imperfect account of it; for the Butchers very unluckily did cut it out, and ſoe its communications with the teſtes, the penis and other parts could not be diſcovered.

What I obſerv'd in it is this, the Spermatick Veſſels at firſt entred but a little way into this ſubſtance; but, below the middle on't, I found them more deeply plac'd; and their Branches grow ſmall and leſs numerous to the ſight: as if here the Veins began. (By the bye I take the beginning of Veins to be from the extream Parts, as that of the Arteries is from the Heart.) The inward Parts of this Subſtance look'd of a paliſh, but ſomewhat muddy red Colour; It was very ſpungy, not much more compact than the Lungs of young Animals. I doubt not but this Subſtance was deſign'd to prepare the Semen.

But by what Veſſels it was brought to the *Penis*, or to any repoſitory (It ſelf containing none) I could not diſcover for the reaſons above mentioned. Neither could I find any peculiar Veſſel, or *Ductus*, or any thing that reſembled one in that aforementioned Subſtance by which I might be directed in my enquiry. It lay lengthways from the Kidneys to the *Teſtes*, with the biggeſt end loweſt. I was ſo intent upon a ſearch for ſome peculiar *Ductus* in this Part, that I clearly forgot to take notice of the *Arteriæ Præparantes*; from what I heard the moſt accurate Anatomiſt, Dr. *Nedham*, ſay of the *partes, generationi inſervientes*, in general, and particularly of thoſe of a Boar; I doubt not but that theſe two Pears faſhion'd now deſcrib'd Subſtances were *Teſtes*; their place, ſize, figure, together with the want of the *vaſa deferentia*, occaſion'd by the Butchers unadviſed cutting them out, were the cauſes of my ignorance heretofore in this point.

I had the *Penis* cut out, with its aprendices, as carefully as I could; and yet I ſaw no *veſiculæ ſeminales*, nor any other common receptacle for the *Semen*, except the formerly mention'd Rhomboide Cells obſerv'd in the

Veſiculæ ſeminales.

the sides of the *Penis* it self. But after all this I cannot but suspect my own unwariness to be the cause of my not observing them; for as much as I was at first convinc'd; that what I found to be really the *prostatæ*, was the *Testes*. Their being closly joyn'd to the *Penis*, and having there a free passage for the *Semen*, into the Cells before mentioned; took off my Curiosity to find out what is generally meant by the *Vesiculæ seminales*, having suspected no such thing.

Diaphragma. The *Diaphragma* was made of very strong carneous and nervous Fibres.

Thorax. The cavity of the *Thorax* was fill'd by the Lungs and Heart; for the Lungs contrary to what I ever observed in other Quadrupeds, *Pulmones.* grew to the *Pleura* as far on each side at least (I forgot whether they grew likewise to the *Sternum* or not) as the *Cartilages* of the Ribs. For thus far I well remember to have separated them, they were so joyned that there was not one place, where you might see a natural separation of them. When I parted the Lungs and the *Pleura*, I found that they were joyned by Membranes that might be split at pleasure: but I could make no clear distinction of them into several Membranes.

By their manner of sticking, they resembled the Lungs of Fowl. By this you may guess how big they were; in other things they agreed with the Lungs of other Animals.

Motus Thoracis. I suppose that this Animal as well as others, inspired by enlarging the Cavity (if I may so call it) of the *Thorax*; which I suppose to be done principally by the motion of the Ribs from acute, to right Angels, as Dr. *Mayo* well observed. And this I take to be performed by the intercostal, Diaphragm, and Muscles of the abdomen; thus the Cavity of the *Thorax*, being every way enlarged, readily receives the Air forced in impetuosly by the weight of the Atmosphære, and I take his expiration to be done by a cessation of the motion of the aforesaid Muscles.

Pericardium. The *Pericardium* was a strong Membrane, and contained a good quantity of *Serum*.

Cor. The Heart was of the usual conical figure, and placed as in other Animals: but it was as large as an ordinary Pompion.

Arteria aorta. The Vessels belonging to it were proportionable. For the *Arteria Aorta* (of which I keep a piece though much shrunk) is round eight inches: and the *Vena Cava* was as much larger

larger then the *Arteria*, as it is usually in other Creatures.

By the bigness of the *Vena Iliaca*, you may perhaps guess better at the *Cava*; The former when slit, did receive and almost cover my four fingers put into it edgewise. *Vena Iliaca.*

The *Auricles* and *Ventricles* were of a size that was suitable to the bigness of the Heart. The *Valves* were so too, and were the same both in number and figure with those in other Animals. *Cordis auriculæ & valvulæ.*

I open'd the *Arteria Pulmonaris* and cut out the three *Valvulæ Mitrales*; which when I measured, I found to be upwards of six of my inches in length. *Arteria pulmonaris.*

There was no passage to be seen in the *Septum Medium.*

I could not find the bone in the Heart, which *Galen* says he found in *Cæsar's* Elephant, dissected by his Order at *Rome.*

The *Carotide Arterie* of this Animal was very large; for it readily receiv'd a large cane into it.

The *Æsophagus* after the usual manner was outwardly Muscular, and inwardly Membranous. The *Muscular Fibres* were much thicker than ordinary; for their thickness upon *Æsophagus*

Maxilla Inferior. on the Membrane was about $\frac{1}{4}$ of an Inch.

The lower Jaw of this Beast, did resemble that of a Hog, the most of any thing.

Lingua. His Tongue was somewhat bigger than that of an Ox, and plac'd after the usual manner. But this it had peculiar in it, that the passage to the *Ventricle* was through it; for there was a hole near the Root of it, and exactly in the middle of that part. Which hole was the beginning of the *Æsophagus*; there was no communication between this and the passage into the Lungs, contrary to what we may observe in Men, in all Quadrupeds and Fowl that ever I had an opportunity to dissect. For the *Membrana Pituitaria Anterior*, reach'd to the very Root of the Tongue below the *Æsophagus*; and so quite stop'd the passage of the Air into the Mouth. From whence we may conclude, that he could not utter any voice by the mouth, and but little by the trunk or nose.

Membra Pituitaria Anterior. The former *Membrana Pituitaria* had many passages for the *Saliva* usually separated there. There was between the end of the *Proboscis* and the *Larinx* a *Membrana Pituitaria posterior*, which had very many of the same sort of *ductus*.

The

The *Proboſcis* was only a noſe prolong'd, where it was ſeparated from the Forehead, the ſubſtance of it look'd exactly like that of a Neats-tongue ſlit: the fleſh of it being curiouſly interlarded. Where the fire had enter'd upon it, I could diſtinctly perceive three Orders of Fibres; one obliquely and ſpirally deſcending; another ſpirally but croſwiſe deſcending; the third were ſtreight Fibres. Several of the notions of his *Proboſcis* might be perform'd by the aforementioned three diſtinct Series's of Muſcular Fibres. As its contraction, motion up, or down, to the right, or to the left: But by what means he was able at pleaſure, to ſhoot it out from a foot upon any ſuddain occaſion to five foot long; and that with extraordinary force, I cannot clearly perceive. This ſort of motion ſeems to require a particular Theory, being very different from the other motions in the Body of this, and of other Animals; for to me all Muſcular motion ſeems to be by a contraction of Fibres, even when the extention of a Part is deſign'd. In which caſe the Bones of the Parts are drawn, and kept directly one before another, by the contraction of ſome of the Muſcles.

The Proboſcis.

Proboſcidis motus varii.

Now

Now we do not find any part without a Bone, (except this) that is Spontaneously protruded or prolong'd, and so kept for some time. Some may Imagine that the Tongue is mov'd after this manner; but 'tis certain, that the *Musculus geneogloſſus* by the help of the *Myloglosſus* draws the root of the Tongue, and consequently the *Os Hyoides* forward, that is, to the fore part of the *Maxilla inferior* where they are inserted, and that so it is that the Tongue is protended.

The onely way that I can gues this motion to be perform'd is by circular Fibres; seeing that there was no Bone towards the end of it, beyond the upper Jaw, whichmight be a *Stabilimentum* to Muscles that might pull it forwards; as the *Geneogloſſus* does the Tongue, by drawing the Basis of it towards the middle of the *Maxilla* inferior. From the swelling of these Circular Fibres (which I suppose to be in the Trunk) we may expect the lengthening of it, for as much, as each of them (being kept from starting outwards by the aforesaid three orders of Fibres and the Skin) must require much more room than they took up before they were swollen. This contraction of annular Fibres must likewise make

make the *Proboſcis* ſmaller, as, upon its ſhooting out, it was obſerv'd always to be.

Now whether *de facto* there were this kind of *Fibres* in it or not, I cannot tell, being hindered by the manager to ſearch for them, leaſt I ſhould make it unfit for preſervation; the Noſtrils for the little way that I ſaw them, were *Cartilaginous*.

At the end of the *Proboſcis* there was, of the ſame ſubſtance with it, a little thing that pointed out like a peak; by which the Elephant was obſerv'd to take up very minute Bodies. I can ſay nothing of the ſtructure of this part.

Doubtleſs the Elephants care to preſerve the *Proboſcis* was great, for when we disjointed him, we found it thruſt near Two Foot into a very hard ground; upon which account we thought that it had been Burnt, till the Head was divided from the Body, and that we found it kept faſt to the ground by the *Proboſcis*.

Aſpera Arteria.

The *Aſpera Arteria* was large, and deſtitute of an *Epiglottis*; there being no danger of any things falling into the Lungs, from Eating or Drinking, ſeeing that there was no

communication between the *Æſophagus* and it.

The *Cartilagines Aritænoides* made a *glottis*, in length about Three Inches and a Quarter, and in breadth about One and a Half towards the middle; this *Aperture* was ſomewhat Oval.

To the outſide of theſe *Cartilages* I found another grow, which was faſten'd to them, but ſo, as to be capable of motion up and down, by the help of ſome *Muſcles* which were implanted in it. It was ſtrong on both ſides of the *Aſpera Arteria*; but oppoſite to the *Æſophagus*, or on the under ſide, it was very limber. This wanted about Two Inches and a Half of coming round the aforeſaid *Cartilages*, on the upper ſide, or that next to the *Æſophagus*. This ſeem'd to me to ſupply in ſome meaſure the want of an *Epiglottis*; in leſſening the *Glottis* to prevent the creeping in of Animals into the *Thorax*.

Larinx. The *Muſcles* of the *larinx* were very ſtrong. I ſuppoſe, that from the ſtructure of this part, we may gueſs at the reaſon, why the Elephant is afraid of a Mouſe, for the Mouſe having room to creep up his *Proboſcis*,

boscis, might get into his Lungs, and so stifle him; there being no *Epiglottis* to hinder its passage, and the aforesaid *Cartilage* being hardly sufficient to shut the way against it; to avoid this danger, this Creature was observ'd always, when he slept, to keep his *Proboscis* so close to the ground, that nothing but Air might get in between them. The Wind-pipe of this in other things, was like that of other Animals. *Aspera Arteria.*

The Eyes were not so remarkable for any thing, as for their disproportion to the rest of the Body, having but little exceeded a Sheeps Eyes. *Oculi.*

The Ears were very large, and indented round; they were always observ'd to hang, except at such times as the Elephant was vex'd, and then they were gather'd like a Purse, and stood forward; at which time he always contracted his *Proboscis*, and so made ready to shoot it out, and to punch either Man or Beast that anger'd him, and came within his reach. *Aures.*

The Soles of his Feet were plain, and cover'd, not with an Horny substance, or Hoof like other *Quadrupeds*, but with a Skin (like a Camel, as I am inform'd,) not half *Planæ pedum.*

as thick as that of his Body, but somewhat harder; it might easily be cut with a Knife in any part. By this means these Animals are secur'd from being founder'd in their Travels, in the much heated Sands of their native Countries; which they could not avoid if they were hoof'd; round the outside of this by the ground, there were five little knobs, answering his five Toes; within this skin there was a great quantity of a greasie substance, contain'd in tough Membranes, in little Cells; this was design'd to defend the Toes from wearing.

The Tusks had Cores in them somewhat like Marrow, but were more compact, and seem'd to have some mixture of *Glanduls* in them.

Dura & pia mater. When I Saw'd the Skull I found a very strong *dura mater*; and a *pia mater* that might without being torn, be separated in many places, from the substance of the Brain; *Cerebrum.* the Brains were much discolour'd, and very tender withal, and therefore could not be taken out entire; and so they were very unfit for Observations.

Ejus pars corticalis. The *Pars Corticalis* of the *Cerebrum* seem'd to be whiter than ordinary; and the *Gyri* more regular than in Men. The

The *Cerebellum* was like that of a Man, only that it was bigger; both it and the *Cerebrum* vveig'd Ten Pounds. *Cerebellum*

If I forget not, I saw the Ten Pair of *Nerves*, as Doctor *Willis* describes them; and can say nothing in particular of them, but that they were very large.

I preserv'd a peice of one of the *Nerves* of the *Os Sacrum*, which was flattish, and but little smaller than a Bulls Pizle. Although I cannot certainly tell, whether that part of the *Nerve* which I prescrib'd, was taken from the *Femur*, where the coalition of Four or Five *Nerves*, proeeeding from the *Os Sacrum*, is usually found, or not; and consequently cannot so probably gues at the size of the other *Nerves*, as otherwise I might; yet this may shew, that the *Nerves* were proportionable to the other parts of this Animal.

The Skeleton is better expres'd by a Plate well Engrav'd, then by any description whatsoever, and therefore, if you design to make this Publick, I desire you would imploy one to take the Icon of it; you may find it with Mr. *Dockwra* Merchant in *Lime-street, London*. I shall not trouble you or my self with a tedi-

ous

ous deſcription of every Bone; but ſhall in ſhort give you the few Notes I thought convenient to take, before a Copper Plate of the Elephant might be had, which may a little inform you, in caſe this be not thought worth Publiſhing.

Cranium. The outward Table of the *Cranium* was very thin, and fragile; between this and the inner, which was not altogether ſo britle, there was nothing but a great number of Cells, (which if I forget not) were for the moſt part Triangular; theſe were lin'd with thin Membranes, in which were many Blood Veſſels curiouſly branch'd; theſe Cells were made of thin Plates of Bone.

The greateſt diſtance between the outward and inner Table, was Seven Inches, and the leaſt, Four; the intermedial were the moſt common; this I would have underſtood of that part of the Skull which I Saw'd for the taking of the Brains. In this place the Head was from outſide to outſide, Twenty Inches and Three Quarters.

The whole *Cranium* was ſo britle and thin, that without a plate of Iron nail'd in the Roof of the Mouth, in which the Iron rod that ran through the *Vertebræ* of the *Dorſum*

and Neck was faſten'd, we could not joyn the Head to the Body without a manifeſt danger of its being torn to pieces by its own weight. If the ſpace between the Tables had been as ſolid in the Skull of the Elephant as it is in thoſe of other Animals, the weight of the Head would be too great, for even the Elephant himſelf to bear. And this may in ſome meaſure appear from the weight of the *Maxilla inferior*, which was but ſmall in reſpect of the other Bones of the Head. This I am told weigh'd ſixty pound, or near upon it. I ſuppoſe therefore, that the aforeſaid Cells were form'd to obviate that great inconveniency, that is, the Heads being too heavy for the Body.

Dentes.

The length of each of the Tuskes was (as I have been inform'd) three foot and a half. When I ſearch'd for them I found one of them burnt to within leſs than a foot of the upper Jaw, in which they both grew. The other was broken off ſomewhat longer; they were bent towards one another, and croſt'd each other near their extremities. The Elephant was obſerved to feed himſelf with his *Promuſcis*, ſometimes thruſt through the ſpace made by the arch'd Teeth: at other times

times by prolonging of it beyond their place of crossing, and then turning of it inwards: and at several times by winding of it about the outside of each of the Tusks to his mouth. Both these reach'd in the upper Jaw, as far as the Sockets for the Eyes; from which they were divided onely by thin shells of Bone. These help'd to keep the formerly mention'd Cores within the Teeth.

There was, besides the Tusks only four Teeth in each Jaw, two in every side.

The length of each of the inner Teeth of the lower Jaw, was about Six Inches and a Half, but the outward of the same Jaw, was only One and Three Quarters long.

The length of the hinder Tooth in the right upper Jaw, was Four Inches; but that of the opposite, was but Three Inches; the Two outward Teeth of the upper Jaw, were somewhat longer then those of the under; the greatest breadth of the Teeth, was Two Inches and Three Quarters; and the least, about an Inch; the breadth of the Teeth of both Jaws was equal; the height of the Teeth above the Gums, was about an Inch and $\frac{1}{4}$; these Eight Teeth were *Molares* and so he had no *Incisores*.

The

The length of the *Maxilla inferior* was 21 Inches and ¾, and the bredth, that is, from the outside of one of the *processus condylodes* to the outside of the other, was 16 Inches and a half. *Maxilla inferior.*

The *Vertebræ* of the *Collum* were 7. those of the *Dorsum* were 20. To each of the latter there was a pair of Ribs, the *Vertebra Lumborum* were only 3. those of the *Os Sacrum* (which are more properly divisions than *Vertebræ*) were six, a good part of the Tail was burnt, and I could not therefore find out the number of Joynts in it. *Vertebræ colli dorsi. Lumborum ossis Sacri.*

The *Processus transversales ac spinæ, dorsi & colli* were distinct Bones from their *Vertebræ*, and joyn'd to them by *sutures*. *Processus transversales & spinæ.*

The *Ulna* and *Radius* did cross one another so, as that the former came from the back part of the *Os humeri* its proper and usual place, and was fasten'd by its other end, to the fore part of the *Carpus*, and the latter went contrarywise; this posture of these Bones is unusual, and seems to add strength to that part. *Ulna. Radius.*

The Back was arch'd like that of a Hog, which Figure contributes the most of any to the strength of it.

I shall give you no further trouble, onely

desire you would satisfie the R. S. that I preserv'd most of the parts, that were not much defac'd by the Fire, nor likely to perish suddainly; till I had leasure to examine them carefully. And in the mean time, I did what I could to inform my self in the Anatomy of those parts which were more or less alter'd by the heat, and were most subject to corruption. And to convince them of this Truth, I desire that you assure them, that I have some parts of the Elephant at this time, which I preserv'd then; and that as oft as I thought fit, I had the use of those parts which were preserv'd, and sent away with the Skeleton; and that so it was that I was able to give even this imperfect account of the Structure of that Creature; this favour I desire from you, least any of them that reads the beginning of this Letter, should believe me unfaithful in relating the matter of fact, when upon the perusal of the remainder, they may find more then possibly they expected; their compliance herein, and kind acceptance of this, may encourage me to present you with other things of this nature. *Sir*,

Trinity College,
May 12*th*, 1682.

Your most Faithful, and
most Obedient Servant,

A. M.

A

RELATION

OF NEW

Anatomical Obſervations

IN THE

EYES

OF

ANIMALS:

Communicated in a

LETTER

To the Honourable

ROBERT BOYLE Eſq;

FELLOW OF

The Royal Society.

By A. M. Med. Bac. *of* Trinity *Colledge near* Dublin.

London, Printed, *Anno* 1682.

RELATION

Barometrical Observations

OF

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ANIMALS,

IN A

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TO

ROBERT BOYLE Esq;

FELLOW OF

THE ROYAL SOCIETY.

Most honoured Sir,

SInce my good Fortune brought me into the number of your Acquaintance, your Favours to me have been so many and so signal, that I thought my self in duty bound to make a grateful acknowledgment of them, and moreover to offer at some suitable return: But *I* find that the Debt is too great for one of my ability to discharge at once, and therefore shall endeavour to do it by degrees, as Fortune shall enable me. What *I* now present you with is but a Mite, which in hopes of your favourable acceptance, *I* freely throw into your inexhaustible Treasury of natural Philosophy. 'Tis only some small Observations that *I* made in the dissection of the Eyes of Animals, which *I* have not found so much as glanced on in any Anatomical Writer. *I* doubt not but that your deep reasoning may soon improve them, so as thereby to solve many of the *Phœnomena*'s of

Vision, more clearly and agreeably to truth, than has been hitherto done.

But before *I* acquaint you with these Observations, *I* suppose that it will not be amiss to let you understand how *I* came to make them, and that was thus: About the beginning of *May* last, the ingenious, and deservedly eminent Dr. *Willoughby*, desired me to dissect an Eye for some understanding Gentlemen of his acquaintance, who were desirous to be informed in the structure of it, that so they might be the better able to judge of the manner of Vision, and of the Solutions generally given of its several *Phænomena*. *I* readily complied with him, and having appointed a convenient time and place, *I* met him and his Friends, having brought some Eyes along with me; to work then *I* went, having passed a Needle and Thread through the Optick Nerve; by this *I* had it held for me, whilst *I* was separating the several Coats, giving them (by the by) to know that the *Tunica innominata* was only an expansion of the Tendons of the Muscles of the Eye, and that the *Conjunctiva* and *adnata* were but one Coat, and that the *Sclerotica* and *Cornea* were another, and that the *Choroeides* and *Uvea* were a third; hereby clearing to them what had often puzled my self heretofore in reading Anatomists on this Subject. *I* was more curious than ordinary

dinary in obſerving the ſeveral parts of the Eye, and careful likewiſe in making them underſtood by them, having taken upon me the part of an *Inſtructer*.

When *I* had quartered the Eye (which is a way *I* often uſe in Anatomizing of it) at the Optick Nerve, and divided it ſo almoſt as far as the *Cornea*, I perceived many Ligaments (for I remember to have reckoned Fifty eight of them in the Eye of an Ox) of a tendinous Nature, proceeding from a part of the *Sclerotica*, which was about half way between the Nerve Optick and the *Proceſſus Ciliaris*, thence paſſing to that part of the *Cornea* to which the ſaid *Proceſſus* is faſtened: Here they were terminated, being in length about half an inch; they were to be ſeen clear round the Eye, being for the moſt part in little furrows made for them in the *Sclerotica*. They were of different ſizes, ſome of them equalling in thickneſs a Thread but indifferently fine, others being ſmaller. They did not paſs through any part of the *Uvea* or *Chorœide*, neither were they joined to the *Ligamenta Ciliaria*: Some of them were divided near their Extremities, and were inſerted into the aforeſaid part obliquely, (few of them falling perpendicularly on it) after they had gone ſome way in a ſtreight line; ſo making a Triangle with the circular Verge of

the

the *Cornea*. These new Ligaments are considerably more tense and thick in a very fresh Eye than in a stale one: Since I first observed them I had not an opportunity to dissect a human Eye, and therefore cannot as yet describe them in it; but in all the Eyes of Quadrupeds that I since opened, I perceived them, though neither so numerous, nor so thick as they were in the Ox Eye, bearing a proportion in both to the Eye it self.

I found these new Ligaments in the Eyes of Fowl, but after a very different manner from those of Quadrupeds, and not less remarkable; for in their Eyes they were (though not above 7 or 8 in number) very near as thick as they were in the Ox Eyes, notwithstanding the great disproportion there is in their bulk. These Ligaments proceeded only from one part of the *Sclerotica*, contrary to that of Quadrupeds, and reached to the Verge of the *Cornea* singly, but more or less obliquely. The first that arrived here was firmly joined to the aforesaid Verge for a considerable way, making almost a Semicircle; Two more on the same side joined with this, and so the Three became one. Three other Ligaments on the opposite side did likewise: Thus I saw them in the Eyes of Geese, Ducks, Pigeons, *&c.*

These

These (as far as I observed) are altogether wanting in the Eyes of Fish, for reasons hereafter to be alledged.

By cutting out the *Tunica cornea* quite, and gently separating the *Sclerotica* from the *Uvea* at the *Processus ciliaris*, I have plainly seen their Terminations, and followed them up to their beginnings, without perforating the *Choroeides*. By this method of searching for the aforesaid Ligaments, (which I take to be altogether as good, if not better, than the other) I observed another thing, of which I shall anon give you an account.

I suppose (but with submission to your better Judgment) that the uses of these new Ligaments, are to draw by their swelling the *Tunica Cornea*, and with that the Christalline humour, nearer the Optick Nerve, when the Cone, made of the visual rays in the Vitreous humour, by the Christalline becomes shorter than ordinary on the account of an extraordinary Refraction: Thus to prevent a confus'd Representation of the Object, which would necessarily happen, if the point of the intersection of the visive rays fell short of the Membrane of Sensation, whether the *Retina* or *Chorceide*. I suppose moreover that for the drawing the Christalline nearer the *Basis* of the Eye, it is necessary the Diameter of the *Sclerotica* should be made greater,

greater, ſo to give way on every ſide to the Vitreous humour, in order to the approach of the Chriſtalline to the Optick Nerve; and that this may very well be done by the aforeſaid Ligaments, they being ſo commodiouſly placed round the Eye for that purpoſe, and the Sockets of the Eyes being large enough ſtill to comprehend them, and give them Liberty to roul: And further, that from this new acquired Figure of the *Sclerotica* proceeds the dilatation of the *Pupilla*. The *Choroeide* (of which the *Iris* is a prolongation, that makes the *Pupilla* greater or ſmaller, as it is more or leſs retracted) being forced to recede with the former, becomes wider in the middle, and conſequently ſhorter.

But I do not think that the *Ligamenta Ciliaria* (if any ſuch things there be) do any way contribute to this action, foraſmuch as they are not conveniently placed for this purpoſe, they being ſo many *Radii* from the circular *Uvea* to the Center, the Chriſtalline, which acting by their intumeſcence, muſt rather prolong the *Tube* of the Eye, and ſo leſſen the *Pupilla*, than any way ſhorten it, becauſe that by their ſwelling they draw the Circumference nearer the Center, and that ſo the humours being ſtraitened for room, muſt be forced forward and backward; by which means the Eye muſt

muſt gain in length what it loſt in its Diameter. I will anon ſubjoin my reaſon for queſtioning the exiſtence of the *Ligamenta Ciliaria*, and endeavour to explain the cauſe of Anatomiſts Errours concerning them.

I do furthermore ſuppoſe, that the *Tunica Cornea* is made more convex by having its Circumference equally drawn back by the ſwelling of the aforeſaid new Ligaments; for the Aqueous humour is by that means forc'd forward, and with it the *Cornea*, whence a greater than ordinary Refraction is made here. That *de facto* the *Cornea* becomes more convex in Fowl, by the means of the aforementioned Ligaments, appears from their peculiar ſituation before deſcribed.

My reaſon for the want of theſe new Ligaments in Fiſh is this: Their Chriſtalline Humour is very near, if not altogether, Globular; upon which account the Refraction made by it muſt be ſo great that the rays muſt unite very ſoon, (and hence it is that their Eyes are ſo depreſſed at the back parts) and therefore, for a diſtinct perception of the Object, it muſt neceſſarily be ſo fixed, that the vertical point of the Cone, made of the rays, ſhall always touch the Membrane of Viſion; which it could not do if the Chriſtalline Humour were moved forward and backward, as it is in

Land-Animals; for so the rays would make either Two Cones, or a section of one, and consequently represent the Object confusedly.

The Christalline Humour of Fowl is more convex than that of Men, or Quadrupeds, and therefore ought not to change its place so much; upon which account I think it is that they have not a proportionable number of the new Ligaments.

From what I observed of these Ligaments, an account may be given of the straining of the Eyes: For when we look at minute Objects with a small light, our *Pupilla*'s may be observed to grow wider, (a manifest sign of the contraction of the aforesaid Ligaments) for the reception of a great many rays, to distinguish the Objects to be painted on the inner Coats of our Eyes. By the continuance of this posture of our Eyes for some time, the aforesaid Ligaments become weary, and so destitute of Spirits to keep them swoln, that they grow flaccid; and so from the straining of these Ligaments we are said to strain our Eyes.

Now, Sir, I shall desire to be resolved by you, whether or no the several motions of the Humors, together with the divers Figures acquired by means of the occasionally swoln *Ligamenta nova* in the Eye, are sufficient to represent Objects to us at all distances, at which they are usually perceived by us, with-

without a neceſſity in our Theory of Viſion, of ſuppoſing an occaſional change of the convexity of the Chriſtalline Humour, which in ſome Animals is ſo compact, that it cannot be eaſily thought ſubject to ſuch alterations by any aſſignable cauſe of them: The only cauſe that I can imagine of theſe changes in the figure of the Chriſtalline, are the *Ligamenta Ciliaria*, whoſe exiſtence I above queſtioned. Now, Sir, (ſuppoſing the being of theſe Ligaments) it is plain from their manner of acting, that they can never contribute any thing to the production of a greater than ordinary refraction of the Rays in the Chriſtalline, foraſmuch as by their contraction, by which they act, the *Sclerotica* and the Chriſtalline being drawn nearer to one another, the Convexity of the latter, by its being drawn out on all ſides would be changed, for a much plainer *ſuperficies*, if its ſolidity would give way to it: And thus probably the rays would require a greater diſtance for their interſection than that between the Chriſtalline and the Optick Nerve, whence would be a confus'd Viſion.

In my ſearch for theſe Ligaments I obſerved that the *Tunica Choroeides* was faſtened in many places to the *Sclerotica* by thin blackiſh flakes, of which this *Tunic* ſeemed to conſiſt. When I conſidered that there were no Veſſels in that Coat that con-

tain'd florid blood, like those in the *Retina*; and that there were always Blood-vessels in the outside of the *Sclerotica* to be seen, answering those flakes in the inside of it, I began to think that the *Choroeide* was an expansion of sanguiferous Vessels that reach'd as far as the extremity of the *Iris*, and sent branches by the way to the Christalline Humour, which made the *Processus Ciliaris*; and that the black pigment of that Coat was only blood so altered in the Figure of its particles by a peculiar Texture of the *Sclerotica*, and conformation of the Blood-Vessels; and that it was contained in those Vessels, till they were lacerated by us in dissecting the Eye. After a more serious consideration, and strict examination of this Coat I became very well satisfied in all those particulars; for by turning the inside of the *Sclerotica* out, and separating the *Choroeide* from it, till I met the aforesaid black flakes, and gently wiping away the pigment with a limber Cloath, to prevent the tearing of them, I found that these flakes were Vessels containing an inky Blood, and that they were continued to the Blood-Vessels found without the *Sclerotica*; and moreover I did clearly find their numerous Ramifications to have made up the outside at least of this Coat, meaning the *Choroeide*. I saw the egress of these Vessels, from the *Sclerotica* near the *Cornea* in many

places,

places, but moſt of all near the Optick Nerve; for here both the Coats were intimately joined by innumerable Veſſels, whoſe Branchings in the *Choroeide* were very conſpicuous, and lay ſo cloſe to one another, that no vacant Interſtice could be perceived between them; they grew ſmaller and ſmaller till they came near the *Proceſſus Ciliaris*: But then I obſerved that 3 or 4, and ſomtimes more of them, did join in one, which went to the Chriſtalline, and helped to make the *Proceſſus Ciliaris*, which of ſuch Veſſels was made clear round. Theſe Veſſels were larger than any that I obſerved, either in the *Choroeide* or *Uvea*. Theſe Veſſels making up the *Proceſſus* aforeſaid, began to be much ſubdivided when they arrived at the *Tunica aranea*, (which, by the by, I have very often ſeen before it was expoſed to the Air one Minute, notwithſtanding what the ingenious Dr. *Briggs* ſays to the contrary) and to ſend Branches not only into the *Tunica aranea*, to which they are firmly joined, but alſo into the vitreous Humour, which gradually becoming diaphanous, diſappeared, and occaſioned (if I miſtake not) the different Opinions of Anatomiſts concerning the *Tunica Hyaloeides*. I am apt to think that the tenacity of the vitreous Humour is due in a great meaſure to theſe Veſſels, numerouſly branched through it, for uſes hereaf-

ter

ter to be assigned, and that from hence it is that the inner as well as outward part of it is tough, and that the nearer the Chrystalline you would lacerate it, the more difficulty you will find in doing so, because that the Vessels are strongest in that place. To these the sticking of this Humour to the Chrystalline is undoubtedly due, as that of the Chrystalline to the *Uvea* or *Choroeides*. In wiping away the pigment from the *Processus ciliaris*, I perceived round, whitish Bodies, which at first I took to be the *Ligamenta ciliaria*, but upon a narrower examination of them I found that they were hollow, having upon pricking, discharged the same blackish Liquor with the rest of the Vessels, before they had it all forced out: But after all this Liquor was thrust out, they looked so like Ligaments that I should have erred (as well as most other Anatomists have) in my opinion of them, had I not before thought the *processus ciliaris* to be a continuation of the Blood-Vessels, which I found made up the *Choroeides* and *Uvea*; and for that Reason informed my self in the truth of it, as well as I could, by frequent dissections of the Eyes of the same, and of different Animals. By this I did very well satisfie my self, that what Anatomists took to be *Ligamenta ciliaria*, was really Blood-Vessels, out of which all their Blood was forced. This I found

pretty

pretty well made out by the following Method, *viz.* *I* ſeparated the *Sclerotica* altogether from the *Choroeide*, and with it the *Cornea*, and then *I* threw it into a Baſon of Water, where *I* moved it to and fro, thereby to waſh the black Liquor out of as many Veſſels as were torn in the ſeparation of the Two Coats. This ſoon diſcovered to me the Diviſions, and Subdiviſions of the aforeſaid Veſſels, and their Coalitions to make the *Proceſſus ciliaris*, and their further diviſions into the vitreous Humor and Chriſtalline.

In the Eyes of Fowl *I* obſerved the *Tunica Choroeides* more plainly to conſiſt of the above mentioned Veſſels, than that of Quadrupeds, before *I* waſhed it in Water: But in the Eyes of Fiſh it was moſt plain of all, for in the Eye of a Whiting the back part of the *Choroeides* was nothing but Veſſels fill'd with florid blood, after a ſoft ſubſtance of divers colours, which defended it from Water, that *I* generally obſerved to lodge between that and the *Sclerotica*, both in this and in other Fiſh, was taken away. This Coat was not lin'd on the inſide with any thing that *I* could obſerve in theſe Animals, but in Quadrupeds *I* always found a ſubſtance in the inſide of the *Choroeide*, which was tender enough to proceed from the *Pia Mater*, and which according to ſome is the Organ of ſenſation.

The

The tenderneſs of it *I* found when *I* turned the inſide of both the *Choroeide* and *Sclerotica* out, by gently ſcraping of it away; for thus without any difficulty *I* have taken away that lining. *I* have not at preſent opportunity enough fully to ſatisfie my ſelf, whether there is any ſuch lining in the Eyes of Fiſh or not; but ſhall, *I* hope, e're it be long, be able to give you an account of it. *I* do the more inſiſt on this now, becauſe that if there be no ſuch thing, *I* ſhall eaſily prove that the *Choroeide* is not the organ of ſenſation, but the *Retina*, notwithſtanding the Experiment with the three Papers.

I do not doubt but there is a circulation of the Humours in the *Choroeide* as well as in all the other parts of the Body; for the Veins on the outſide of the *Sclerotica* contain a ſubſtance very like that pigment, if not the ſame, which queſtionleſs is ſent thither in order to its mixture with the maſs of Blood. *I* do not ſee any reaſon why the Reparation of the Humours of the Eyes is not as requiſite, as that of the other parts of the Body, which we find continually done by the circulation of the Blood, foraſmuch as in a litteral ſenſe we die dayly.

Doubtleſs it is from Natures care in repairing them as they are waſted, that the aqueous Humour in

Fowl

Fowl is ſo ſuddenly reproduced after it has been ſpilt: 'Tis probable for the ſame Reaſon, that it would be ſo in other Animals too; for it is eaſie to conceive how a *ſerum* will gleet out at theſe Capillary Veſſels, when they are not ſo ſhut up by any *Cuticula* or Membrane; but that there is ſome paſſages left neceſſarily open for the ſupply of what is waſted of the watry Humour, to prevent the *Cornea*'s growing flaccid, as we find it does in a little time after the Animal is dead; which I ſuppoſe is occaſioned by the ſtagnation of the Blood, becauſe that it is not recruited as it is ſpent, as it was wont to be by the circulation of the humours in the living Eye. We may from this notion give a probable account of Cataracts, which I take to be this:

The Veſſels in the *Iris* may at ſome times be more open than is requiſite, for the *ſerum* of the Blood to get in to the aqueous humour, to repair what is ſpent in perſpiration, and ſo may give way to a viſcid matter, diluted by the *ſerum*, to the ſame humour, where it muſt lie ſtagnant, foraſmuch as it cannot paſs through the Pores of the *Cornea* along with the *ſerum*, becauſe of the ſmallneſs and incongruity of the Pores to the viſcid Particles; and ſo in time it acquires a conſiſtency, like that in old diſtilled Waters, which is called

the Mother: And thus losing its transparency by degrees, it gradually intercepts the visive Rayes before their arrival at the Christalline; whence first an obscure, and at length no Vision at all. This slimy matter, called the Cataract, in a long time becomes ripe; that is, arrives at so great a degree of viscidity, that, without breaking, it will endure winding about a Needle, in order to its being couched, or laid behind the *Iris*, between that and the Christalline Humour.

The contrivance of the *Choroeide* is very admirable, not only for repairing what is continually wasted in the Three Humours, but also for fixing the Christalline Humour in the most convenient place for refracting the Rayes, and so as to be capable of being moved backward or forward upon occasion: And moreover for altering the Texture of the Blood, so as to darken it self for the most commodious Picturing of the Objects by the Christalline, in order to sensation. This *I* suppose it does by carrying back in its Vessels all the feculencies which may get into the Humours, and might make them unfit for refracting or transmitting the Rays, and by sending a Blood, either precipitated, or so changed by a peculiar Conformation of its Vessels, to preserve, with a transparent *succus*, the humours in their due proportion, making

making the Capillary Subdiviſions no way adapted to the black and groſser Particles.

I have ſeen in the Eyes of Fowl what the curious *Monſieur Perault* firſt obſerved in them, namely the little black bag, reaching from the Chriſtalline Humour, to which it is faſtened through the vitreous to the Nerve Optick, into which it is received (if my memory does not fail me,) and is withoutſide continued to the Blood-Veſsels, which he ſuppoſes to be a *Cloaca*, deſigned to defecate the Humours which in theſe Animals ought to be extraordinary clear, for the diſtinct perception of Objects at a great diſtance. I have ſeen the like (if I forget not) in the Eyes of Fiſh. I take this to defecate the Humours after the ſame manner that the Veſsels of the *Choroeide* do, and like them to bring nouriſhment too, being rather a *Faſciculus* of Veſsels, than properly a common ſhore.

I forgot to let you know another Method that I uſed to find the Ramifications of the Veſsels, which *I* deſcribed in the *Choroeides*, *Uvea*, *Proceſſus ciliaris*, and vitreous Humour, which was nothing inferiour to the others above mentioned: *I* ſhall therefore acquaint you with it now, being as follows.

I kept the Eyes of an Ox for Two or Three days, in hopes that the black Liquor contained in

the Veſsels, might ferment to that degree, that it would be able to burſt the tender Veſsels; and that ſo they would be cleared of a great part of it, by which means their Diviſions and Coaliti-ons might be the better diſcovered. This ſuc-ceeded according to my Expectation; for having taken off the *Sclerotica* and *Cornea*, and thrown the Eye into Water, and there ſtirred it for ſome time, *I* ſaw all that *I* above deſcribed very plainly.

Since I firſt made the aforegoing Obſervations in the diſsection of the Eye, my occaſions were ſuch, that I could not ſpare time to make a comparative Anatomy of the Eyes of moſt Animals to be had in our Countries, which I take to be the beſt way of informing our ſelves in their ſtructure, and in find-ing out the uſes of their ſeveral parts: But e're long I hope I ſhall have leiſure to purſue that deſign, & be able to give you a further account of this mat-ter, which I ſhall not neglect to do, being reſolved to omi' no opportunity of manifeſting my ſenſe of your Obligations, and to ſatisfie you that I am,

Moſt honoured Sir,

Your moſt faithful,

London,
Aug. 28, 1682.

Humble Servant:

A. M.

Table

TABLE I.

Fig. 1

REpreſents *the* Skeleton *with the Tusks entire as they were ſuppos'd to be, but without the Cartilages of the Ribs and* Sternum *through the Painters neglect.*

A A *Are two Tusks in the* Maxilla ſuperior *as the Painter gueſs'd them to be before they were broken or burnt, being in length* $3\frac{1}{2}$ *inches as I was inform'd.*

B *That part of the* Maxilla ſuperior, *which receiv'd the Tusks in length* 11 *inches, for ſo far they reach'd in it.*

C *The* Os Frontis, *which was very brittle and thin.*

D *The ſocket for the left Eye.*

E Os Zygomaticum ſeu jugale.

F *The* Maxilla inferior, *the greateſt length of which is* $21\frac{1}{4}$ *and the greateſt diſtance from one ſide to the other,* $16\frac{1}{2}$ *inches.*

G *The ſecond Grinder (the firſt being loſt is undeſcrib'd) of the lower Jaw in length* $6\frac{1}{2}$, *in breadth between* $2\frac{1}{4}$, *and* $1\frac{1}{2}$, *in height above the bone about* 2 *inches.*

H *The two Grinders of the* Maxilla ſuperior, *not diſtinguiſh'd by the Painter, whereof the one forward is about* 2 *inches long, and the backward one about* $3\frac{1}{2}$ *its breadth and height is equal to that. In the* Maxilla inferior

ferior, *the teeth of both the jaws for the more convenient grinding have three or four orders of parallel ridges and furrows.*

I I *The first and last of the* Vertebræ *of the Neck, in number* 7, *though* 5 *only are hereby represented.*

K *The* Scapula *without the Cartilage growing to it, is in length from the* Acetabulum *for the* os humeri *by the* ſpina 17½ *inches.*

ϰ *The* ſpina *of the* Scapula.

L A proceſſus *of the* ſpina *in length* 4 *inches, deſign'd to ſtrengthen the* Muſculus Trapezius.

M *The* proceſſus Coracoides *in length about* 3 *inches.*

N Os humeri *in length* 25 *inches, its meaſure round in the ſmalleſt part is* 10 *inches, but in the greateſt excepting the Epiphyſes is* 17½ *that is at* O.

P *The* radius *croſſing the* ulna *near the* carpus *is in length* 20 *inches.*

Q Ulna *is in length* 23 *inches.*

R *The* Carpus *conſiſting of* 6 *bones is* 3 *inches long.*

S *The* Metatarſus *conſiſting of* 15 *bones in length is* 7½ *inches.*

T T T *The ribs in number* 40, *the greateſt length of which (without the cartilages) is* 32 *inches.*

V V V V *The* Proceſſus tranſverſales.

W W *The* ſpinæ dorſi (*equal in number to the* vertebræ *of the back*) *are twenty.*

X X *The* vertebræ *of the Loyns* 3 *only in number.*

Y *The* Os innominatum *is in length* 25 *inches, the* Ilea *were* 30 *inches wide, the* Pelvis 10½ *wide and* 13½ *long.*

Z *The* ſpina *of the* Os Ileum.

a a a a a *The* ſpinæ *of the* Os Sacrum 5 *in number.*

b b *The* 8 *joints left unburnt of the tail.*

c *The* Os pubis. d. *The*

d *The* Trochanter minor *so plac'd, that neither the* Acetabulum *of the* Os Coxendicis, *nor the* Trochenter major *appear, it was from the* major 9½ *inch. in distance.*

f *The* Os Femoris *in length* 28 *inches, its measure round in the smallest part of it is* 11½.

g *The* patella *or knee pan.*

h Os Tibiæ 19 *inches long, its measure round at the smallest part of it is* 7½ *at the thickest about* 14.

i *The* Fibula *about the same length with the* Tibia.

k *The* Calcaneum.

l l *The bones of the* Tarsus *being* 8 *in number.*

m m m m. *The* Metatarsus *consisting of* 15 *bones is* 7½ *inches long.*

Fig. 2.

Represents the Proboscis *as it was divided from the Skull with the underside up.*

A A *The two Nostrils.*

a A Cartilage *which I found round within both the Nostrils, and was very limber.*

B B B *Are several inequalities or wrinkles occasion'd by the divers motions of it.*

D *A little peak by which the Elephant was observ'd to take up very minute bodies off the ground.*

b b *Are the two Nostrils at the end off the* Trunk.

E E E *The length of the Trunk underneath was above* 32 *inches.*

F F F *The length of the upper part of the* Proboscis 44 *inches.*

Fig.

Fig. 3.

REpreſents the Tongue.
A The tip of the Tongue, from which C C or the paſſage into the Æſophagus is 20½.
B A hollowneſs anſwerable to which was the Muſculus Geneogloſſus, which ti'd it to the Maxilla inferior.
C C A furrow ſhallow at the outſides, but growing deeper and deeper to the middle or paſſage into the Æſophagus is in length 7½ inches.
D A hole in the middle of this part of the Tongue from which the Æſophagus began.

Fig. 4.

REpreſents the Colon and part of the Rectum blown out, thereby to preſerve them; the greateſt meaſure of theſe round is 42 inches, their length is about five foot.

TABLE II.

Fig. 1.

REpreſents the Penis, which is in length 2 foot.
A The end of the Urethra.
B A circle round the Penis from which the glans begins.

C. A

C *A nervous body inserted within* $5\frac{1}{2}$ *inches of the glans, being in length* 9 *inches; which came out of the yard about* 8 *inches from its root, design'd to pull back the Yard,*

D *The end of a* Tendon *not describ'd, which seems to be design'd for the retraction of the yard.*

E E *Are the ends of the* Tendons *of the* Musculi Retractores Penis *a little before their coalition; from hence to their insertion into the* Penis *is* 7 *inches, and from that to the extremity of the glans is about* 9 *inches.*

F *The beginning of the* Urethra, *large enough to receive a mans thumb.*

G *The place where the yard being measur'd round, was found to be* 9 *inches.*

Fig. 2.

Represents the skull with the under side of it turn'd up; and that which was saw'd out for the taking out of the brains laid close to it.

A A A A A A *Represents the cells that were in the skull between the two Tables.*

B *The hollow part, of that part of the skull that was saw'd out, which contain'd the brains.*

C *The passage for the* Spinalis Medulla, *which was* $2\frac{1}{2}$ *inches in diameter.*

D *The outward Table, which was very thin and as brittle.*

E *The inner* Table, *which is a little stronger than the outward, and which here is* 7 *inches and upwards from it.*

F F *The upper part of the* Occiput, *close by which the part of the skull which was sow'd out is plac'd for the more*

convenient representation of the hollow for the brains and cells in both.

G *A hollow made for the brains in this part of the skull, which together with that in the others, was large enough to contain* 10 *pounds the weight of the brains.*

H *The passage from the* Trunck *or* Proboscis *into the Windpipe* $4\frac{1}{2}$ *inches long, and* $3\frac{1}{2}$ *broad.*

I I *The two large back grinders in length between* 3 *and* 4 *inches, in breadth between* $1\frac{1}{2}$ *and* $2\frac{1}{2}$ *inches, in height without the* Maxilla *about* 2 *inches.*

K *The least distance between the two* Tables, *which was* 4 *inches.*

L L *Here the distance from the outward table of one side to that of the opposite was* $20\frac{1}{2}$.

Fig. 3.

Represents the fore-part of the Skull, &c.

A *The right* Tusk *broken by the Elephant in endeavouring to get loose, about* 18 *inches long.*

a *The hole in that* Tusk *which contain'd a glandulous core with a mixture of Marrow.*

B *The left* Tusk, *as it was burnt short by the fire.*

C C *The holes in the ends of the* Tusks, *out of which the cores were taken.*

D D *The Sockets for the eyes, whose greatest breadth is* $6\frac{1}{2}$ *and whose greatest length is* $9\frac{1}{2}$ *inches.*

E E Os Zygomaticum seu jugale.

F *The* Os Frontis *in length about* 10 *inches.*

G G G *The cells between both the* Tables *appearing, where a part of the outward was burnt.*

H H *The passage into the lungs, the greatest breadth of which*

which is 9 *inches*; *and the leaſt diſtance between the* Os Frontis, *and* maxilla ſuperior *is* 3 *inches.*

I *The* Maxilla ſuperior *in length* 18 *inches, 'tis from the lower part of it to the former paſſage* 11.

K K *The diſtance between the* Oſſa Zygomatica, *was* 21 *inches.*

Fig. 4.

Repreſents the Eye of an Ox.

A. *The Optick Nerve freed from the fat and muſcles uſually ſticking to it.*

B B B B *Are the blood veſſels in the* Tunica Sclerotica, *to which thoſe that make up the* Choroeid *and* Uvea *are continu'd.*

C *The* Sclerotica *freed from the* Adnata, *and the muſcles for the better perception of the blood veſſels.*

Fig. 5.

Repreſents the Eye of an Ox quarter'd at the Optick Nerve.

A. *The Optick Nerve in one of the quarters of the* Sclerotica.

B B B B *The* 4 *quarters of the* Sclerotica.

C C C *The choroeides turn'd down after it is ſeparated from the* Sclerotica, *to exhibite the ramifications of the* ſanguineus, *which make up this coat; and their egreſs from the* Sclerotica.

D *A part of the* Choroeide, *ſeparated at the* Proceſſus ciliaris, *from the* Sclerotica, *and then turn'd up to ſhew more plainly the branchings of theſe veſſels, and the place where they come through the* Sclerotica.

Fig. 6.

R*Epreſents the Eye of an Ox.*

A A A A *The* 4 *quarters of the* Sclerotica, *freed altogether from the* Tunica *C*horoeides, *for the better deſcovery of the* Ligamenta Nova.

B B *Rudely ſhews the* Ligamenta Nova, *proceeding from the* Sclerotica *to the verge of the* Cornea, *to which the* Proceſſus ciliaris *is faſten'd.*

Fig. 7.

R*Epreſents the eye of a Gooſe quarter'd as that of the Ox, and freed from the* Tunica *C*horoeides.

AAAA *Shews the* Ligamenta Nova *come from one part of the* Sclerotica, *being in number about* 7 *or* 8, *and joining at the verge of the* Cornea *into two indifferent thick ligaments, one for each ſide, making almoſt a ſemicircle.*

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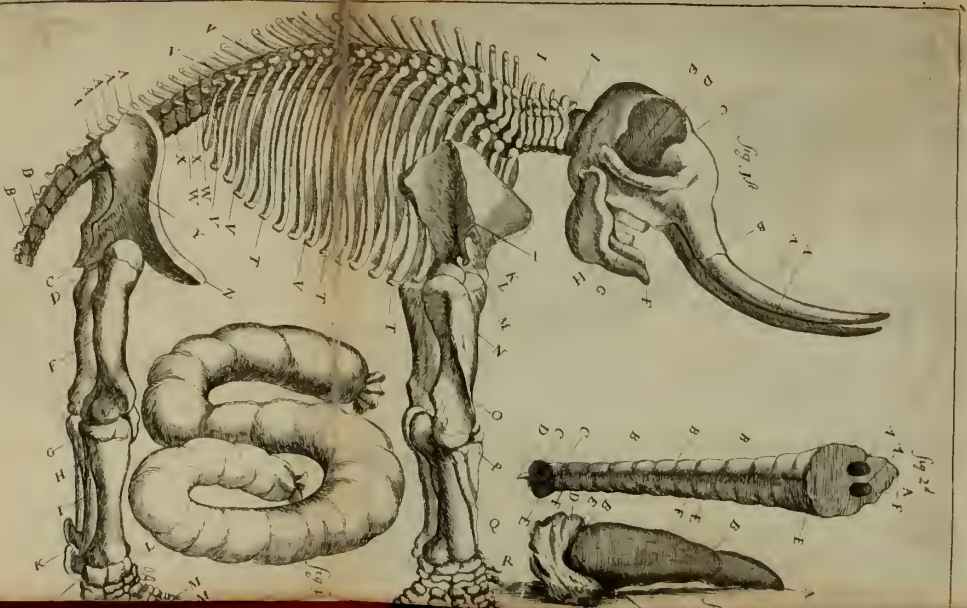
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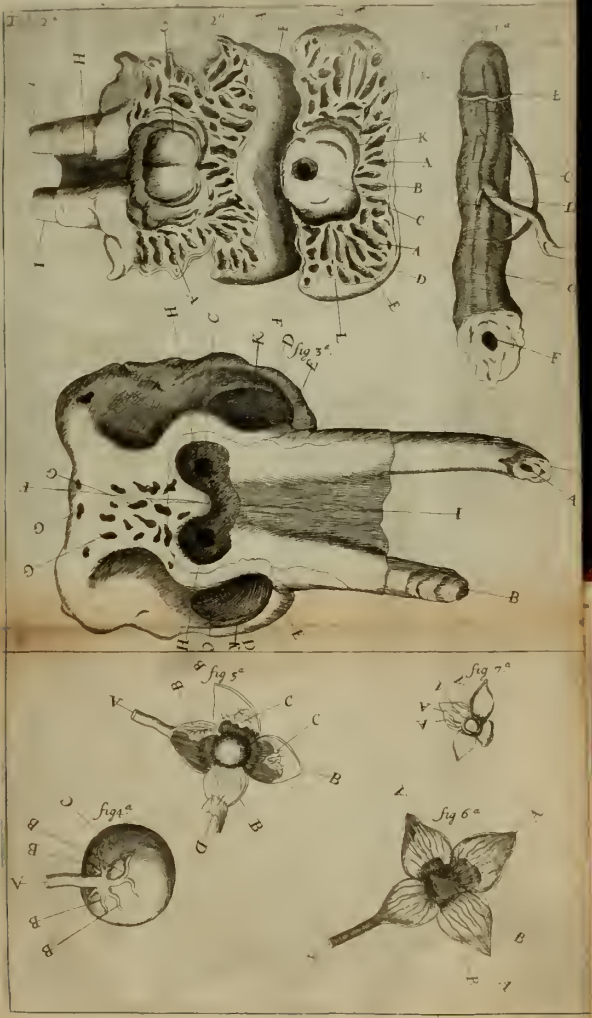
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